Receive Four Square System

DXE-RFS-2P
DXE-RFS-TS2P

DXE-RFS-2P-INS Revision 2

DXE-RFS-TS2P Components Shown

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Introduction

There are two packaged systems available:

DXE-RFS-2P - Receive Four Square Array Controller & Control Box

The **DXE-RFS-2P** is a sophisticated receiving system that uses time delay phasing rather than the conventional narrow-band, frequency dependent phasing systems. The time delay phasing is directivity-optimized to produce wider and deeper rear nulls and a narrower main lobe. The result is that noise and undesirable signals are greatly reduced for a superior front-to-rear ratio (F/R). Better control of phase and currents provides a cleaner pattern than found on available transmit four square arrays.

The **DXE-RFS-2P** is optimized to use DX Engineering's Active Vertical Antenna Package, **DXE-ARAV2-4P**. The two products together offer great F/R response over octaves of bandwidth. DX Engineering's Active Receive Antenna System offers excellent receiving performance from 100 kHz to 30 MHz while using only a 102 in. whip as the antenna element. A unique design makes it vastly superior to traditional active antennas in both strong signal handling and feedline decoupling. This results in significantly better weak signal reception due to lower spurious signal interference and reduced noise.

Finally, this system offers greater reliability in receiving applications. The **DXE-RFS-2P** uses sealed relays sized for receiving applications with silver contacts to prevent oxidation and contamination. Most transmitting four square switches use large open-frame relays where the contacts are exposed to air which can lead to contamination. Relays with brass contacts can oxidize leading to poor conductivity.

Advantages of the **DXE-RFS-2P** Receive Four Square Antenna System over other small or medium-size receiving arrays include:

- Reduced susceptibility to high angle signals compared to EWE, Flag, Pennant, and K9AY antennas
- Excellent directivity in a small space for better signal-to-noise ratio
- Switchable in four 90 degree spaced directions
- Directivity over a very wide frequency range using DX Engineering active receive elements **DXE-ARAV2-4P**
- Less physical space required than a Beverage antenna and active elements need only a minimal ground system
- Enhanced relay contact reliability

The **DXE-RFS-2P** includes the **DXE-CC-8** Receive Four Square Switch controller. The **CC-8** interfaces to the **RFS-2** through a 3 or 4 wire cable to select one of four directions on the **RFS-2** and to power the active elements. Economically priced **DXE-CW9** is a 9 conductor Shielded Control Wire which may be used.

DXE-RFS-TS2P - Complete Receive Four Square Array Package for Normal Spacing to Transmit Antennas

Complete Receive Four Square Array package for Close Spacing to Transmit Antenna

- W8JI design
- Operates from 100 kHz to 30 MHz
- Excellent directivity in a small space for better signal-to noise ratio
- Switchable in four 90 degree spaced directions
- Reduced susceptibility to high angle signals compared to EWE, Flag, Pennant, or K9AY arrays

DXE-RFS-TS2P is a complete Receive Four Square Array Package for Close spacing to transmit antenna which includes:

- (1) **DXE-ARAV2-4P** Package of four Active Receive Vertical Antennas w/ Internal Antenna Disconnect Relays
- (1) **DXE-CC-8** 8 Position Control Console
- (1) **DXE-RFS-2** Receiving Four Square Antenna Switch
- (1) **DXE-TVSU-1** Time Variable Sequence Unit
- (1) **DXE-F6-1000** CATV F-6 Style Coax, 75 ohm, F6 Flooded for Direct Burial, 1000' Spool
- (1) **DXE-CPT-659** CATV F-6, RG-6 and RG-59 Coax Cable Stripper, Includes 1 Replacement Blade
- (25) **DXE-SNS6-25** Snap-N-Seal 75 Ohm Coax Connectors for CATV F-6 Cable
- (1) **DXE-SNS-CT1** Crimp Tool for Snap-N-Seal 75 Ohm Coax Connectors

System Overview

The **DXE-RFS-2** is an advanced four square receiving system that uses four symmetrically spaced elements to provide switching for a 4-direction receiving antenna system. This unique system uses time delay phasing rather than the single band phase shifting used in traditional four squares. When used with active receive elements, this time delay phasing scheme provides the correct phase relationship across a wide frequency range and useful front-to-rear ratio (F/R) response over octaves of bandwidth.

This system uses directionally-optimized time delays to produce wider and deeper rear nulls. Wide null areas and a narrow main lobe greatly reduce noise and undesirable signals.

The system is more reliable than a conventional transmitting four square system in receiving applications. Most transmitting four squares use large, exposed open-frame relays which can become contaminated or corroded. This system uses sealed relays; contact size is optimized for receiving applications.

Features

Advantages of the **DXE-RFS-2P** Receive Four Square Antenna System over other receiving arrays include:

- Seamless stainless steel **DXE-RFS-2** enclosure, for enhanced weather resistance
- Reduced susceptibility to high angle signals compared to EWE, Flag, Pennant, and K9AY antennas
- Excellent directivity in a small space for better signal-to-noise ratio
- Switching of four 90 degree spaced directions
- Directivity over a very wide frequency range using DX Engineering's Active Receive Antennas
- Requires less space than a Beverage antenna. Active elements need only a minimal ground system
- Using active elements, system allows close proximity to transmit antennas using transmit/receive sequencer
- Enhanced relay contact reliability

Prerequisite

This manual covers both the **DXE-RFS-2P** stand-alone unit and the **DXE-RFS-TS2P** system.

This manual will describe the **DXE-RFS-TS2P** total system package in detail.

The **DXE-RFS-2P** includes the **DXE-RFS-2** Receive Four Square Switching Unit and the **DXE-CC-8** Control Console.

The **DXE-RFS-2** includes just the Receive Four Square Switching Unit. The stand-alone **DXE-RFS-2** unit must be connected with the appropriate power and switching voltages as defined in the **Control & Power Section** of this document. The **DXE-RFS-2** can also be used with passive elements.

The DXE-RFS-2 is a sophisticated system that has critical control voltage and three delay line connections.

Failure to make quality feedline or delay line connections might result in an array that does not work or performs poorly.

Additional Parts Required, Not Supplied with the DXE-RFS-TS2P

Four-Conductor Power and Control Cable for DXE-RFS-2, Default Configuration

4-conductor cable (3 plus ground), 22 gauge minimum. Alternate configurations use a 1-or 2-conductor cable. Economically priced **DXE-CW9** is a 9 conductor Shielded Control Wire which may be used.

Additional Parts Required, Not Supplied with the DXE-RFS-2P

DXE-CAVS-1P Mounting Clamp for DXE-RFS-2

Pre-drilled mounting bracket accepts pipe sizes from 1/2 inch to 1 3/4 inches.

Four-Conductor Power and Control Cable for DXE-RFS-2, Default Configuration

4-conductor cable (3 plus ground), 22 gauge minimum. Alternate configurations use a 1-or 2-conductor cable. Economically priced **DXE-CW9** is a 9 conductor Shielded Control Wire which may be used.

75 Ω Coax Cable (CATV F6 Style), Connectors and Installation Tools

When calculating cable length, include connections from the phasing unit to each active element, the 3 delay lines and the distance to the operating position. You must use 75 Ω coax with a known velocity factor (VF) for all connections.

We recommend using a high quality, 75 Ω “flooded” F6 type coax, such as DX Engineering part number **DXE-F6-1000**. Flooded-style cables automatically seal small accidental cuts or lacerations in the cable jacket. Flooded cables also prevent shield contamination and can be direct-buried.

Feedline connections must have good integrity and be weather resistant. We recommend Snap-N-Seal type F connectors. The complete **DXE-RFS-2** system, including feedline connections, requires 16 type F connectors. **DXE-SNS6-25** contains 25 Snap-N-Seal connectors, enough for the entire array plus nine spare connectors.

***Note**: The **DXE-CPT-659** stripping tool prepares F6 style cable for connectors in one easy and clean operation and comes with an extra cutting cartridge.*

Snap-N-Seal connectors cannot be installed with normal crimping tools or pliers. The **DXE-SNS-CT1** is an essential tool for proper connector installation.

***Note:** **DO NOT** use pliers or other tools to tighten the type F connectors; they do not require high torque to make a good connection. Damage to the various units may result and is not covered under warranty.*

Example of Array Performance

Dedicated receive antennas have better signal-to-noise ratios. Directing the antenna away from noise sources or toward the desired signal path is the primary benefit. Antenna gain is a secondary advantage. As frequency increases, the fixed array size becomes electrically larger in terms of wavelength. The increased electrical spacing produces higher sensitivity (average gain) even though front-to-rear ratio only changes slightly. On the low bands, once the receiving system limits on external noise, antenna directivity (F/R) is the only thing that affects the signal-to-noise ratio.

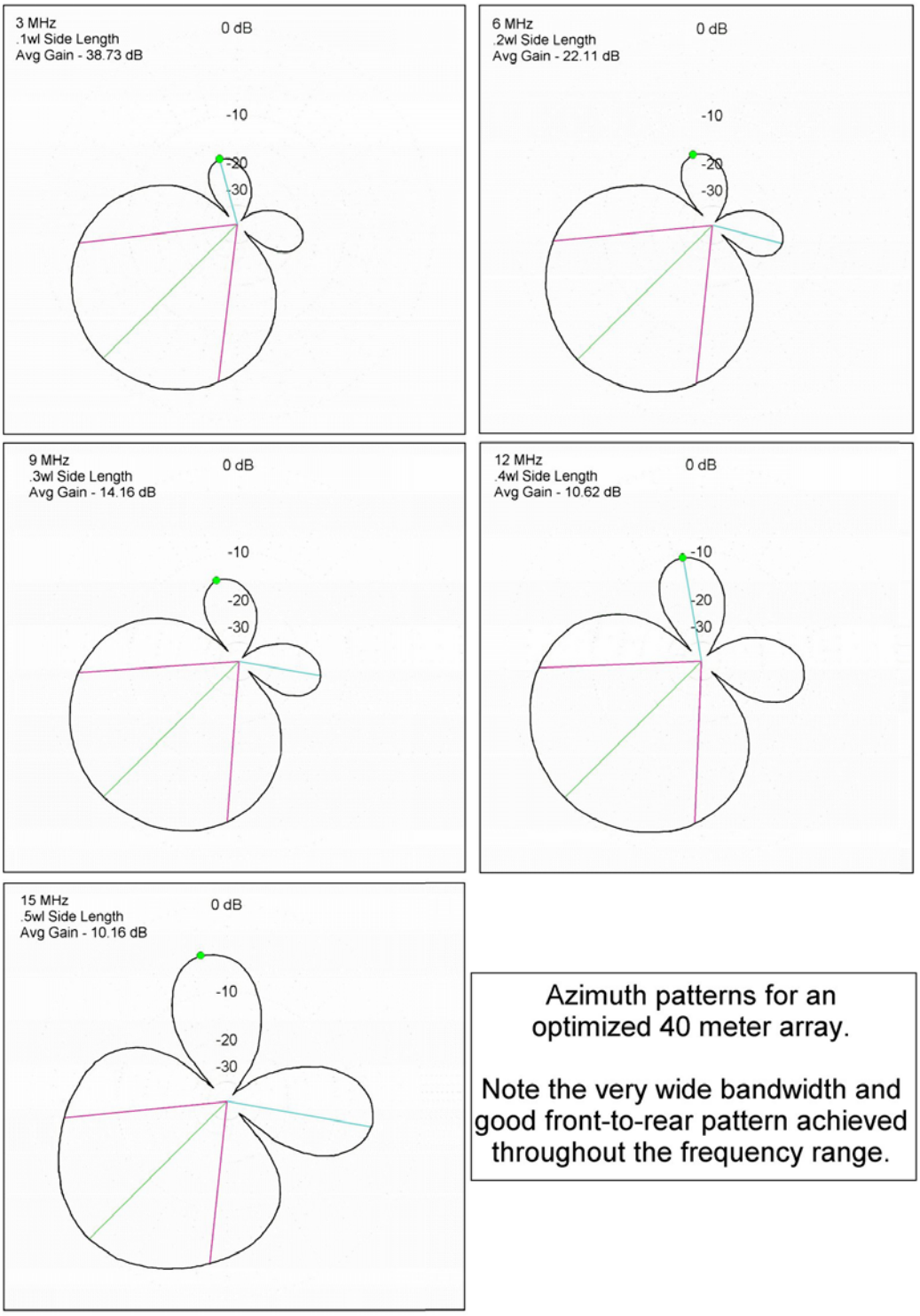
An average Beverage antenna exhibits about -6 dB gain. You would need two reversible Beverage systems to obtain 4-direction selectivity and you still would be limited to one or two bands. The **DXE-RFS-2** occupies less space, is much easier to install, is less conspicuous and operates over a wider frequency range with similar or better performance.

A test array, constructed at DX Engineering using the **ARAV** Active Elements and a side length of 35 feet, showed excellent performance across a wide frequency range. This side length is optimal for 40m, according to **Table 2**. The array worked from 3 MHz to 15 MHz. As shown on the following page, the patterns stay clean with good directivity and front-to-rear performance. The elevation angle is 15 degrees for all patterns. Amplification is required below 3 MHz.

Note: The **RFS-2** Receiving system must be separated from transmitting or other antennas and structures (particularly metal) by at least 1/2 wavelength. Less separation may cause significant pattern distortion and the introduction of re-radiated noise into the system. This becomes apparent as reduced front-to-rear directivity in one or more directions or a higher noise level.

In a different test array with 50 ft side lengths, optimum performance occurred between 3 and 4 MHz. Performance on 7 MHz was also excellent. Amplification was used below 2 MHz. The highest usable frequency was 10 MHz. This array also produced usable F/R ratios down to the lower end of the AM broadcast band (600 kHz).

Increasing the array size increases its sensitivity on the lower frequencies, sliding the performance curve toward the low frequencies and potentially eliminating the need for amplification.



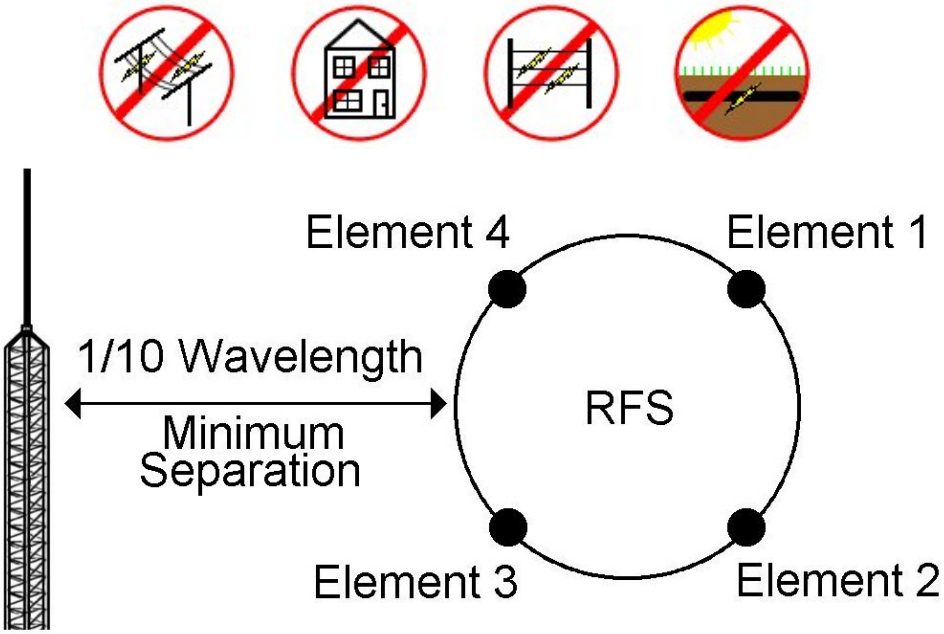
Azimuth patterns for an optimized 40 meter array.

Note the very wide bandwidth and good front-to-rear pattern achieved throughout the frequency range.

Site Selection

Site selection is important. The **DXE-RFS-2** system can be positioned as close as 1/10 wavelength to transmitting antennas. The **DXE-ARAV2-1P** Active Elements are bypassed to ground when power is turned off. A programmable sequencer, such as the **DXE-TVSU-1,** is required for close spacing requirements. The **DXE-TVSU-1** is included in the **DXE-RFS-TS2P** complete Receive Four Square Array Package.

Significant pattern distortion or coupling may result from close spacing. To prevent pattern degradation or re-radiation of electrical noise or other interference, separation of 1/2 wavelength (at the lowest operating frequency) is ideal. See **Figure 1**. The goal is to do the best you can by balancing all the factors.



1/10 wavelength is the ***minimum*** distance to any transmitting antenna from the Four Square perimeter. 1/2 wavelength is the best distance to prevent coupling to other antennas.

Figure 1 - Site Selection Clear Distance

Proximity to Transmitting Antennas

The **DXE-ARAV2-1P** active elements and your transmitting antenna need only minimal physical separation to maintain safe power levels when the **DXE-TVSU-1** sequencer is used. With 1500 watts output and a unity gain (0 dB) antenna, the closest active element can be 1/10 wavelength from the transmitting antenna at the lowest transmitting frequency. Doubling the protection distance quadruples safe power levels. See **Table 1**.

For example, transmitting legal-limit power output (1500 watts) into an ideal four square transmitting antenna produces about 6,000 watts ERP (6 dB gain). Because of the increased radiated power level, nearly 1/2 wavelength minimum spacing between the transmitting and receiving antenna arrays is required.

Table 1 indicates minimum safe distances from transmitting antennas with 0 dB, 3 dB and 6 dB gain (ERP) using a 1500 watt transmitter. Your actual measurements may vary according to location and proximity to various objects.

Band	Unity (0 dB) Gain	3 dB Gain (2x)	6 dB Gain (4x)
160m (1.8 MHz)	55 ft	110 ft	220 ft
80m (3.5 MHz)	28 ft	56 ft	112 ft
40m (7.0 MHz)	15 ft	30 ft	60 ft

Table 1 - Array 1500w ERP Safety Distance

Topographical Considerations

Flat land is best. Erecting the receiving array on sloped land or steep hills may degrade performance. To avoid pattern degradation, antenna elements must have reasonably similar elevations. It's recommended the ground height difference between any element in the array be less than 10% of the array diameter. For example, a 60 foot diameter array should be within six feet of level. Every effort should be taken to make the elements symmetrical. Elements should all be identical in construction and grounding, and should be mounted above any standing water or snow line but as close to the ground as possible. In general, the system will not be affected by trees or foliage as long as the foliage does not contact the element. Ideally, in important receiving directions, there should be a clear electrical path for at least 1 wavelength. The site should allow a ground system to be evenly distributed around the antenna, if one is required.

Site Selection in Relation to Noise Sources

Because the array is directional across its corners, use this example as a guide: If you have a noise source and if your primary listening area is northeast, locate the array northeast of the dominant noise source. This ensures the array is looking away from the source of noise when beaming in the primary listening direction. The second-best location for the array is when the noise source is as far as possible from either side of the array. If you look at patterns, the ideal location for the array is one that places undesired noise in a deep null area.

If your location doesn’t have the usual noise sources (power lines, electric fences, etc.), locate the array so that your transmitting antennas and buildings are off the back or side of the receiving array.

Noise that limits the ability to hear a weak signal on the lower bands is generally a mixture of local ground wave and ionosphere propagated noise sources. Some installations suffer from a dominant noise source located close to the antennas. Noise level differences between urban and rural locations can be more than 30 dB during the daytime on 160 meters. Nighttime can bring a dramatic increase

in the overall noise level as noise propagates via the ionosphere from multiple distant sources. Since the noise is external to the antenna, directivity can reduce noise intensity.
Consider these things about noise sources:

- If noise is not evenly distributed, performance will depend on the gain difference between the desired signal direction (azimuth and elevation) and average gain in the direction of noise.
- If noise predominantly arrives from the direction and angle of desired signals (assuming polarization of signals and noise are the same) there will be no improvement in the signal-to-noise ratio.

If the noise originates in the near-field of the antenna, everything becomes unpredictable. This is a good case for placing receiving antennas as far from noise sources (such as power lines) as possible.

Ground System

The **ARAV2-1P** Active Elements work well with just a single copper ground rod placed as close as possible to the mounting pipe. The mounting pipe can be used as the system ground if the pipe is an adequate ground. It is recommended that a 3/4" or larger rigid copper water pipe, although conventional copper coated steel rods may also work. Depending on soil conductivity, you can expect better performance with multiple ground rods spaced a few feet apart. Increasing ground rod depth beyond 5 ft rarely improves RF grounding because skin effect in the soil prevents current from flowing deep in the soil. Avoid ground rods less than 5/8" O.D. A good ground system improves the array performance and enhances lightning survivability. It is important that each ground system be the same for each active antenna in the array.

You can test ground quality by listening to a steady local signal. Attach 15 ft of wire laid in a straight line (away from the coaxial feedline) to the initial 4 ft to 6 ft ground rod. If you observe a change in signal or noise level, you need to improve the ground. A second rod spaced a few feet away from the first one may correct the problem or 10 to 12 ground radials, each 15 ft long, should provide a sufficient ground system for most soil conditions. If a good ground cannot be established, use an optional **DXE-RFCC-1** Receive Feedline Current Choke that will further decouple the feedline from the antenna and reduce common mode current and associated noise from the feedline.

Lightning Protection

While amateur radio installations rarely suffer damage from lightning, the best protection is to disconnect electrical devices during storms. The key to lightning survival is to properly ground feedlines and equipment and to maintain the integrity of shield connections. A proper installation improves lightning protection and enhances weak signal receiving performance.

Consult lightning protection and station grounding information in the ARRL handbooks, or by referring to the NEC (National Electric Code). The DX Engineering website also has technical and product information listed under “Lightning Protection and Grounding.” Use lightning surge protectors for the coax feedline and control lines.

Sizing the Array

When using active elements, the array side length can be as small as 1/10 wavelength and up to about 1/2 wavelength on the highest frequency to be used. Sizes below 1/10 wavelength result in unusable array sensitivity in the most desired bands. Making side lengths larger than 1/2 wavelength on the highest frequency will split the main lobe and cause pattern and front-to-back degradation. Determine the size of the array by considering the availability of appropriate space, frequency coverage desired and the near proximity to undesirable noise sources, transmitting antennas and other structures.

If there are no space constraints, follow the array side length recommendations in **Table 2** for excellent performance. Side lengths longer than the optimal lengths shown will move the peak sensitivity of the array toward the lower frequency. For example, if you are most interested in 160m performance with occasional use on 80m, make the side lengths longer than the optimal 98 feet shown for 160m and 80m. This will improve 160m performance, reduce sensitivity on 80m somewhat, but less than sizing the array exactly for 160m.

Band	Freq - MHz	Optimal Side Length in Ft	Min. Side Length in Ft	Max. Side Length in Ft
160	1.83	135	54	270
80	3.60	70	28	140
40	7.10	35	14	70
160, 80	1.83, 3.60	98	40	192
80, 40	3.60, 7.10	50	20	98
160, 80, 40	1.83, 3.60, 7.10	70	28	137

Table 2 - Array Side Lengths

If you have limited space, a carefully installed and amplified **DXE-RFS-2** can be used on multiple bands with very small side lengths. At smaller side lengths, careful construction using precise measurements is critical. On a fixed-size array, as frequency is decreased, the array signal output decreases along with array sensitivity. Eventually the received ambient noise signal level will decrease to a point where it is below your receiver's noise floor. This comes from two effects:

- Elements become electrically shorter, reducing element sensitivity
- Element spacing becomes smaller in electrical degrees, reducing array sensitivity

Side lengths at 1/10 wavelength on 40m would only be 14 ft. Although usable, amplification would be required. In addition, the construction of a very small array is extremely critical. Side lengths must be perfectly symmetrical. The delay lines must be directly measured for electrical length and cut to exact lengths. The ground system must be effective. Even at this small spacing, the array will have useful front-to-rear performance and directivity!

Four Square Layout

The array antenna elements should be arranged in a square, use **Table 2** for guidance in choosing the best combination of frequency coverage and side length dimensions.

- The diagonal corners of the square should point in the most desirable receiving directions. Element 1 is the default forward element, Element 3 is the rear or null element.

- Performance of the **RFS-2** can noticeably decrease if structures radiating even small amounts of noise or signals are within 1-wavelength of the array

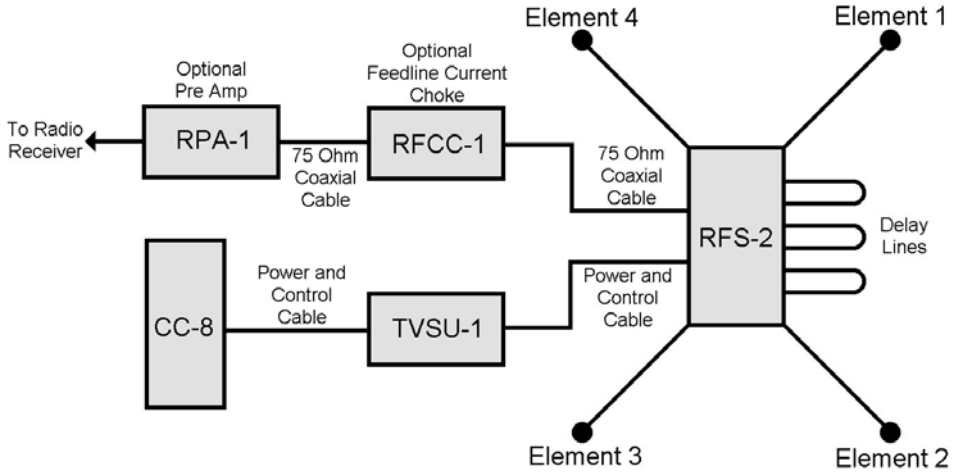


Figure 2 - Layout of the DXE-RFS-TS2P Four Square System

- Measure side-to-side and then corner-to-corner to ensure the element locations are square.

- Normally the **RFS-2** phasing unit is installed near the center of the four array elements, above any standing water or snow line, with the connector side facing down. The placement of the **RFS-2** unit is not critical, however, the feedlines to each of the active elements must be equal.

- If you mount the **RFS-2** on a wood post, it should be grounded to a separate ground rod.

System Operational Overview

The **DXE-RFS-2P** system is comprised of the **DXE-CC-8** Control Console and the **DXE-RFS-2** Control Unit. These units interconnect and work together using factory default settings. If you purchased only the **DXE-RFS-2** Control Unit, you must provide the power and switching voltages to the **DXE-RFS-2**. Please refer to the appropriate tables and the configuration diagrams in this manual for details.

The **DXE-CC-8** Control Console supplies the nominal +12 Vdc operational voltage as well as the +12 Vdc BCD control voltage. The operational voltage powers the **DXE-RFS-2** Control Unit which subsequently powers the active receive elements. The BCD switching voltages cause the **DXE-RFS-2** to change the receiving direction of the array.

The **DXE-CC-8** Control Console is configured by default to output the BCD control voltages needed by the **DXE-RFS-2**. Only the last four positions of the **DXE-CC-8** are used (LEDs 5 through 8) because the **DXE-RFS-2** only requires a 2-bit BCD control logic. The array is powered when the **DXE-CC-8** has selected LED 5, 6, 7, or 8. The default direction for the array (toward Element 1) is selected when LED 5 on the **DXE-CC-8** is illuminated. When positions 6 to 8 are selected on the CC-8, the array switches directions according to the directional control matrix in **Table 4**. Refer to **Diagram 1** for default connection details.

The **DXE-RFS-2** distributes the operating power to the active elements through the individual element feedlines. The active elements do not work without power. Cutting power to the **DXE-RFS-2** also cuts power to the active elements which causes the **DXE-AVA-2** to ground the vertical element. Operating with the **DXE-TVSU-1** Sequencer (inserted into the **CC-8** "C" to the **RFS-2** "C" terminal) makes this power switching function automatically.

An alternate configuration, which uses the feedline coax for either the operational power or the directional control voltages, can be used. This configuration requires internal jumper changes in the **DXE-RFS-2**, along with additional hardware to couple the proper voltage to the feedline. For directional control through the feedline, the **DXE-RFS-2** requires +12 Vdc, ─12 Vdc and 12 Vac. The **DXE-FVC-1** Voltage Coupler can be used to supply these voltages. Operational voltage is a nominal +12 Vdc, which can be provided by station power if a 1A in-line fuse is used.

In any alternate configuration, do not use coax or other conductor for more than one simultaneous use. Refer to **Diagram 2** for connection details of one of several alternate configurations.

Installation

The **DXE-RFS-2** Control Unit can be mounted to a galvanized pipe driven into the ground. The **DXE-RFS-2** unit has been pre-drilled to accommodate up to a 2 inch O.D. pipe using an appropriate clamp. If pipe mounting is desired, the optional **DXE-CAVS-1P** V-Bolt Saddle clamp for pipe from 3/4" to 1-3/4" inches O.D. is recommended, or **DXE-CAVS-2P** V-Bolt Saddle Clamp for 1" to 2" O.D. pipe. The controller can also be mounted on a sturdy wooden post, but provision for grounding the **DXE-RFS-2** unit must be made.

The **DXE-RFS-2** is designed to be used with the DX Engineering Active Vertical Antennas or it can be used with passive elements. The user manual included with the active elements has instructions for assembly and installation. As noted in that manual, the active elements should be installed as close to the ground as possible but above any standing water or snow line. **Ground the ANT– (negative) terminal to an adequate ground.**

Active Antenna Elements

If you are planning to use the array on 160m, a jumper in the active antenna matching units should be changed. Placing a jumper on L1MF will peak the array sensitivity response for use on 160m, with little effect on 80m, when the recommended array side lengths in **Table 2** are used. When

doing this the sensitivity for the AM broadcast band will be reduced. All four active elements in the array must have identical jumper settings.

For access to the jumpers in the active matching units, remove the 2 screws on each side of the case and remove the bottom. The circuit board and jumper headers will be visible, as shown in **Figure 3**. By default, there are no jumpers across any pins. Place a jumper across L1MF. Do not jumper any other positions. See the Active Antenna User Manual for more information about additional peak response jumper settings.

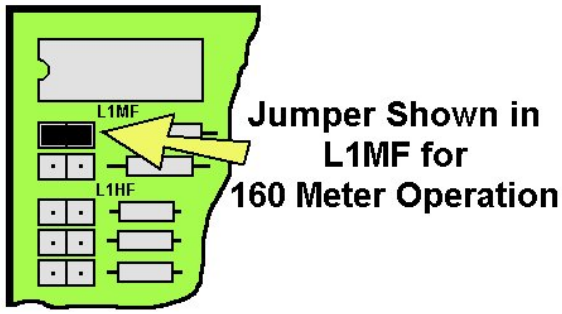


Figure 3 - Active Element L1MF Jumper Locations

Please read the manuals for the **DXE-ARAV** Active Elements and **DXE-CC-8** Controller so you understand their operation before proceeding.

Station Feedline, Active Antenna Feedline and Delay Lines

The weakest link in an antenna system, such as the **DXE-RFS-2**, is often the coax cable connections. All connections must be high quality and weather tight to prevent contamination and corrosion, which can cause the feedline impedance to change. This can affect the signal-to-noise ratio and the directivity of the array. In addition, the **DXE-RFS-2** uses the shield as a ground return path for the active element power.

Note: The total loop resistance of the ground path must be under 30 Ω for reliable operation.

If the resistance of the shield increases due to contamination, the active elements may not function properly. Any splices in the feedline should be high quality and entirely weather tight. Do not use splices in the delay line cables. The **DXE-RFS-2** system has been designed to use only 75 Ω coax.

High quality, flooded 75 Ω CATV F6 type coax is recommended. **DXE-F6-1000** Flooded cables automatically seal small accidental cuts or lacerations in the jacket. Flooded cable also prevents shield contamination and can be direct-buried.

DX Engineering offers an inexpensive preparation tool, part number **DXE-CPT-659,** that readies the coax for connectors in one operation and comes with an extra cutting cartridge. To ensure weather tight connections, use **DXE-SNS6-25** Snap-N-Seal compression style connectors. **DXE-SNS6-25** contains 25 Snap-N-Seal connectors, enough for the entire array plus some spares. The Snap-N-Seal connectors cannot be installed with normal crimping tools or pliers, so you must use

an installation tool like the **DXE-SNS-CT1**, available from DX Engineering, for proper connector installation.

Active Antenna Feedlines

Use 75 Ω coax from each antenna element to the **DXE-RFS-2**. The four feedlines from the **DXE-RFS-2** phasing unit to the active elements can be any length needed to accommodate the size of the array, but must all be the same length, velocity factor and type. Note the orientation and numbering of the elements by using **Figure 2**. Be sure the appropriate antenna element is connected to the proper ANT connector on the phasing unit. The default (zero control voltage) forward direction is towards Element 1. Element 3 is the rear or null direction.

Delay Lines

The **DXE-RFS-2** uses a time delay system, not a traditional phasing system. Delay line lengths are dictated by array dimensions rather than operating frequency. This results in phase being correct for a rearward null at any frequency. This system is especially effective when used with DX Engineering ARAV active elements. User-supplied passive elements can also provide exceptional performance for single or dual band operation where high dynamic range is required.

The **DXE-RFS-2** phasing unit has three sets of delay line connections marked DLY1, DLY2 and DLY3. Each of these connection pairs will have a specific length of coax acting as a jumper between the two connectors. Jumper electrical length is critical. Careful measurements and the use of 75 Ω coax with a known Velocity Factor (VF) is very important.

Solid Teflon® or polyethylene dielectric coax cable has a VF of approximately 0.66. Foamed coax cables typically range anywhere between 0.75 and 0.90 VF, depending on the ratio of air-to-dielectric material in the cable core.

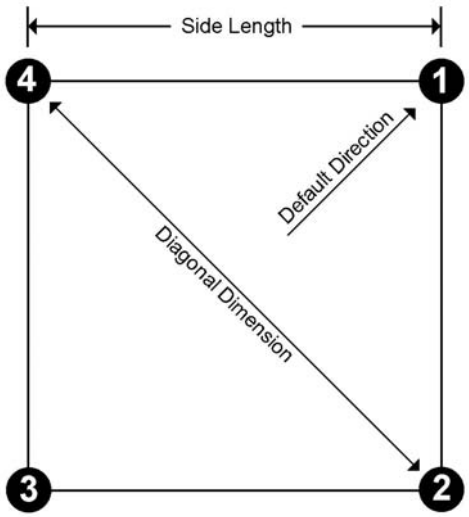
If you do not know the VF of the coax you are using, you must directly measure the electrical length of the coax you have or obtain cable with a known VF. The DX Engineering **DXE-F6-1000** 75 Ω coax has a nominal VF of 0.85. For best performance, the coax for the delay lines should be from the same batch or spool.

The first step is to determine the required **electrical** length of DLY3. This is based on the corner-to-corner or diagonal distance between two diagonal corner elements of the square forming the array. You can directly measure this distance, or it can be calculated by multiplying the side length of the array by 1.4142. The **electrical** length of delay line DLY3 should be slightly shorter than the actual physical distance between the two diagonal corners of the array. An electrical length 95% of the physical distance works well (diagonal distance times 0.95). **Table 3** shows these calculations for three common side lengths.

Side Length in Feet	Diagonal Physical Length in Feet	Factored 0.95 Electrical Length in Feet	DLY3 Physical Length in Feet (0.85 VF)
135 (160m)	190.9	181.4	154.2
98 (160m & 80m)	138.6	131.7	111.9
70 (80m)	99.0	94.0	79.9

Table 3 - Examples of DLY3 Required Length

After calculating the required electrical length, you must include the VF of the coax being used when determining the correct physical length of DLY3. Multiply the factored electrical length by the VF. The result is the correct physical length for DLY3. See **Figure 4** and the sidebar for an example. ***Note:*** *These calculations are in feet, not feet and inches.*



To find the physical length of DLY3, calculate the diagonal length of the array by either directly measuring the diagonal or by multiplying the array side length by 1.4142. DLY3 will be significantly shorter than the actual physical length. The diagonal length is first multiplied by 0.95. This gives the factored electrical length for DLY3. Next, multiply the DLY3 electrical length by the VF of the delay line coax. The result is the correct physical length for DLY3.

Figure 4 - Diagonal Dimension

For Example: An array with 90 foot side spacing, the diagonal length is 127.3 feet. The 0.95 factored physical length for DLY3 electrical length is 120.9 ft. Multiply 120.9 ft. by 0.85 (the VF of DX Engineering 75 Ω coax).

The correct physical length for DLY3 is 102.77 feet, or 102 feet 9 inches.

Delay lines DLY1 and DLY2 must be half the length of DLY3. Make DLY1 and DLY2 as close to half the physical length of DLY3 as possible. To avoid performance degradation due to inconsistent coax construction, all the delay line coax should be cut from the same spool.

Delay line cables can be neatly coiled in a 1-1/2 ft diameter coil. Support the weight of the cables by taping or securing them to the support pole or mast rather than allowing them to hang from the connectors.

It is important to use 75 Ω feedline to the operating position from the **DXE-RFS-2**. Do not use amplifiers, combiners, filters or splitters that are not optimized for 75 Ω systems.

Control and Power Connections

Prior to installation, you should decide if you want to use the factory configuration or an alternate one. If you have the **DXE-RFS-2P** system, with the **DXE-CC-8** Control Console, no other equipment is needed for powering the **DXE-RFS-2P**, the active elements or controlling the receive direction of the **DXE-RFS-2P**. The **DXE-RFS-2P** has been factory-set to work with the **DXE-CC-8**. If you have a stand-alone RFS-2, several configuration options need to be considered before installation.

J12 is the 5-terminal connector plug on the front panel of the **DXE-RFS-2**. It is labeled **G A B C G**.

G	Ground. Both "**G**" terminals are common ground	
A & **B**	2 bit BCD directional control inputs	
C	Operational power from the **DXE-RFS-2** and active elements	

Depending on jumper configuration, terminal C can also be used for directional control using differential voltages. The coax must then be used to supply operational power.

The **DXE-CC-8** uses the same 5-terminal plug labeled "BCD". The terminals use the same names.

CC-8 **RFS-2**

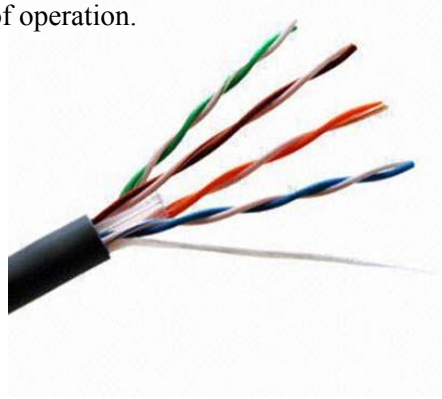
On both the **DXE-CC-8** and the **DXE-RFS-2**, the green connectors are in two parts and the top part can be removed by pulling it straight off. This will allow easier wire replacement or servicing as needed. When pushing the connector back in place, ensure you press straight inward.

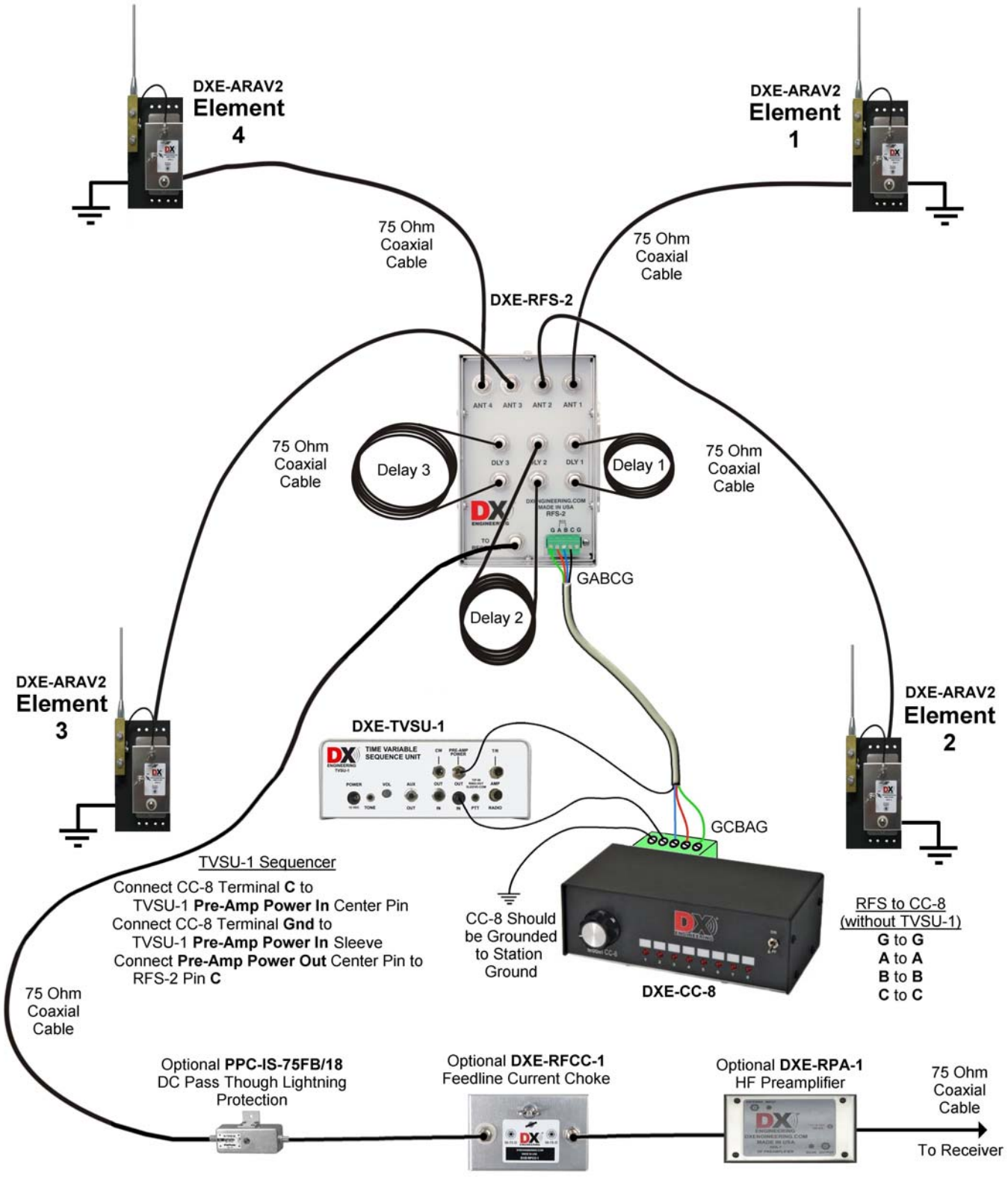
Default Configuration

The **DXE-RFS-2** default configuration uses terminals A & B for the BCD directional control interface and terminal C for operational and active element power. The **DXE-CC-8** provides the operational power as well as the 2-bit BCD interface used for directional control. A user-supplied 4-conductor cable is needed to connect the **DXE-RFS-2** and the **DXE-CC-8**.

Choose a 4-conductor cable (3+ ground) of at least 22 gauge for lengths up to 1500 feet. If you use a cable with more conductors, it is a good idea to tie the unused conductors to ground. Use point-to-point wiring, matching the terminal labels at each end. Economically priced **DXE-CW9** is a 9 conductor Shielded Control Wire which may be used.

DXE-CW9 is made of 24 AWG wire. Since the **DXE-RFS** needs four lines, the **DXE-CW9** could be doubled up (example: orange & orange/white wires connected together at both ends) to increase the wire gage size and increase the length of operation.





DXE-RFS-TS2P Default Connection Diagram Using Factory Jumper Settings

Shown with optional **PPC-IS-75B/18** DC Pass Through Lightning Protection, optional **DXE-RFCC-1** Feedline Current Choke, and optional **DXE-RPA-1** HF Preamplifier

Alternate Configurations

The **DXE-RFS-2** can be configured to use the coaxial feedline for power or directional control, but not simultaneously. **Diagram 2** illustrates one way to use the feedline for directional control with optional hardware. Other configurations are possible. Do not make contradictory jumper settings.

> Any alternate configuration requires changing the internal jumpers from their default settings.
>
> Be very careful about changing the default jumper settings. **You must not jumper the DXE-RFS-2 so that power and directional control are done on the same conductor**. This will damage the **DXE-RFS-2** or the active elements and is not covered under warranty.

Supplying Power Using the Feedline

If you use the feedline to supply operational power, then directional control must be done using the J12 connector. There are two ways to do directional control through J12 when using the coax for power:

- Differential voltages (+/–12 Vdc & 12 Vac) using terminal C. This can be done using a 1 or 2 conductor cable. Economically priced **DXE-CW9** is a 9 conductor Shielded Control Wire which may be used. See **Table 5** for the control matrix. The optional **DXE-FVC-1** can be used to generate the required differential voltages using a 1 or 2 conductor cable. Feedline shield can be used as the ground return.

- 2 bit BCD style control voltage using terminals A & B.
  See **Table 4**. This requires at least a 2 conductor cable. Economically priced **DXE-CW9** is a 9 conductor Shielded Control Wire which may be used. The feedline shield can be used for the ground return provided it is grounded at the common power source.

If you choose to use the feedline to provide power to the **DXE-RFS-2**, you will have to supply your own coupling circuit to insert the required +12 Vdc on the feedline.

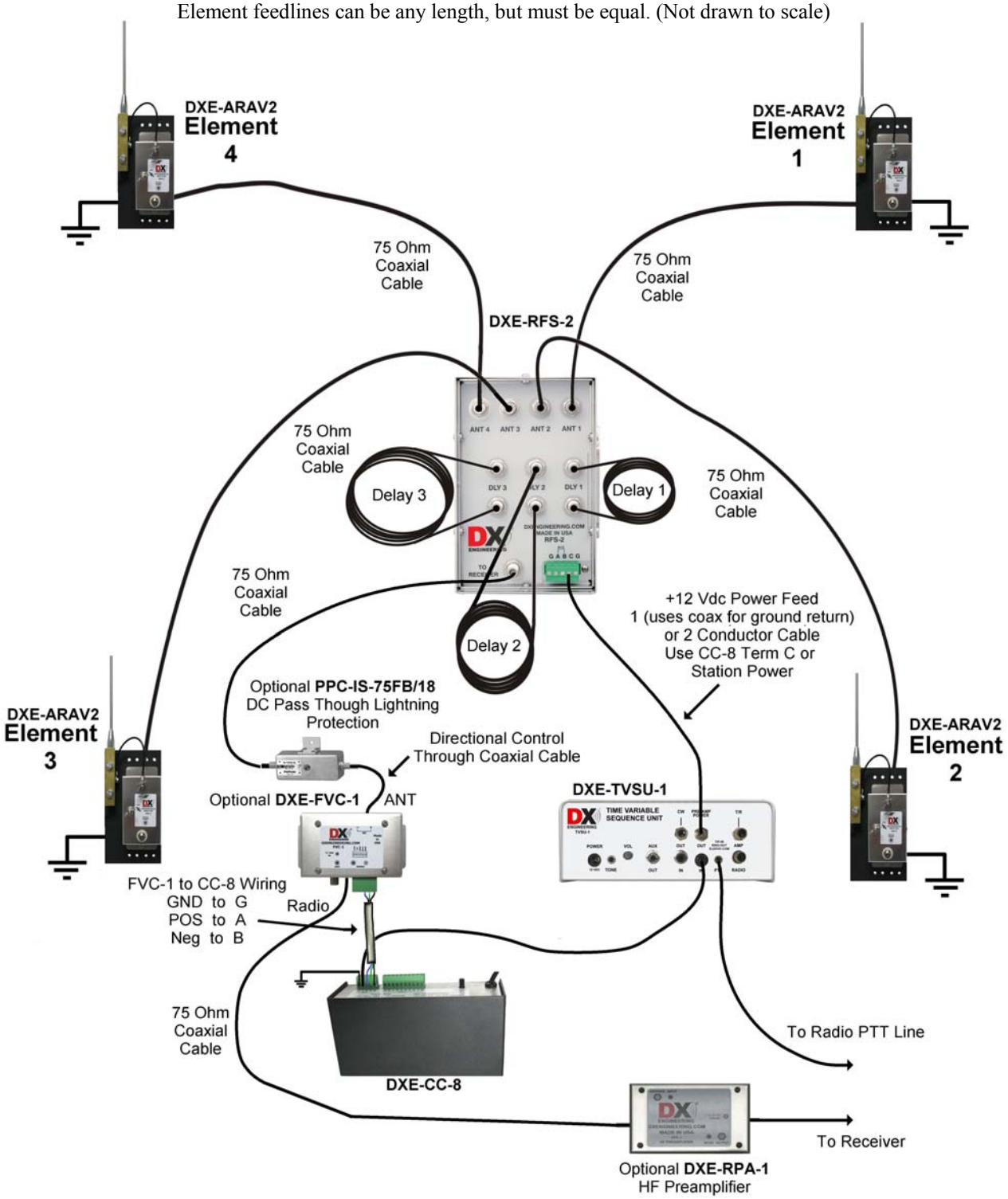
Directional Control Using the Feedline

If you use the feedline for directional control, then you must provide power for the **DXE-RFS-2** using terminal C of the J12 connector. Terminals A & B are not used. A single conductor cable is needed to power the **DXE-RFS-2** and active elements. Station power (nominal +12 Vdc) can be used provided a 1A in-line fuse is used. **Diagram 2** illustrates the coax being used for directional control and the use of station power.

Using the feedline for directional control requires differential voltages to switch directions. Use **Table 5** for the control matrix. The optional **DXE-FVC-1** can be used to generate and couple the required differential voltages to the feedline or a single conductor cable. The **DXE-FVC-1** can be controlled with a CC-8 with a simple switch closure-to-ground scheme. The **DXE-FVC-1** provides only the directional control voltages. Study the configuration diagrams on the next pages and the Internal Jumper Settings on page 26 before making any changes to the default settings. **Diagram 2** shows the **DXE-FVC-1** used for directional control.

Diagram 2 - Alternate Configuration

All Element feedlines, delay lines and station feedlines must be 75 Ohm coaxial cable.
Element feedlines can be any length, but must be equal. (Not drawn to scale)

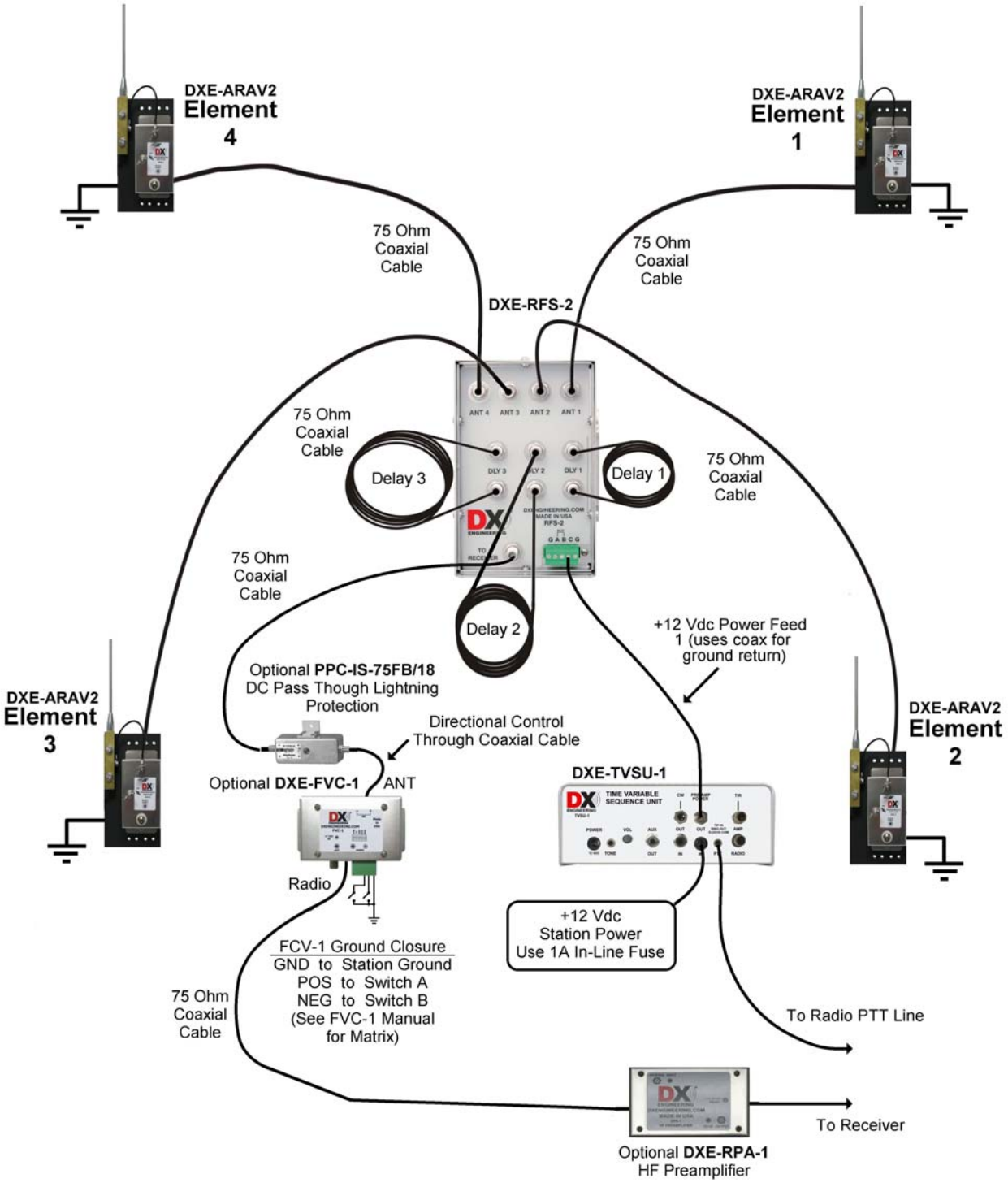


RFS-2 Alternate Configuration, Requires Internal Jumper Changes

Uses Optional DXE-FVC-1 to control direction using the feedline
Uses DXE-CC-8 BCD interface to control the FVC-1 (may also use ground closure)
Power to the RFS-2 uses terminal C of the CC-8 (switch positions 5 to 8)
Route power from the TVSU-1 Pre-Amp Power IN jack from CC-8 Terminal C
Connect the TVSU-1 Pre-Amp Power OUT jack to the power wire for the RFS-2

Diagram 3 - Alternate Configuration

All Element feedlines, delay lines and station feedlines must be 75 Ohm coaxial cable.
Element feedlines can be any length, but must be equal. (Not drawn to scale)



RFS-2 Alternate Configuration, Requires Internal Jumper Changes

Uses optional **DXE-FVC-1** to control direction using feedline.
Uses Ground-Closure Interface to control the **FVC-1**
DXE-TVSU-1 used with station power

DXE-RFS-2 and Active Element Power

The **DXE-RFS-2** phasing unit uses and distributes the voltage to power the active antenna elements. For all four active elements, a nominal +12-15 Vdc at 200 mA current is required. The default configuration uses Terminal C on the 5-position plug for power.

The **DXE-CC-8** uses positions 5 through 8 to power and control the **DXE-RFS-2**. The default direction is selected when LED #5 is illuminated. This setting provides operating voltage on Terminal C of the **DXE-CC-8**, which is connected to Terminal C on the **DXE-RFS-2**. (The active elements do not work without power.) See **Table 4**; note that "C" has voltage in all four positions. If the **TVSU-1** Sequencer is used, it will provide keyed power for the **DXE-RFS-2** for the active verticals.

Alternatively, the coax can be used to power the elements. This requires the default jumper settings to be changed. See the next section for alternate jumper settings. You must provide a way to couple this voltage on the feedline.

Directional Control

The default configuration of the **DXE-RFS-2** phasing unit uses a 2-bit, +12 Vdc BCD interface scheme to switch directions through a user-supplied 4 conductor cable connected to the **DXE-CC-8**. The default direction without applied control voltage is in the direction of Element 1. Element 3 is the default rear or null direction.

Table 4 shows the array direction, the truth table for the BCD interface (A&B) and the status of the LED indicators on the **DXE-CC-8** for each direction. (Terminal C is used to power the **DXE-RFS-2** so it is always on.)

Forward Direction	Rear Direction	A	B	C	CC-8 LED Illuminated
Element 1 (Default)	Element 3 (Default)	**0**	**0**	**1**	# 5
Element 2	Element 4	**1**	**0**	**1**	#6
Element 3	Element 1	**0**	**1**	**1**	#7
Element 4	Element 2	**1**	**1**	**1**	#8

Table 4 - BCD Directional Control Matrix, "1" Equals +12 Vdc (Default)

Alternatively, directional control using differential voltages can be done through the coax feedline or Terminal C on the **DXE-FS-2**. This requires the default jumper settings to be changed. See the next section for jumper settings. Directional control through Terminal C requires only one conductor plus a ground return path. That return path can be the coax shield or an additional conductor specifically dedicated to that purpose. Terminal C cannot be used for powering the **DXE-RFS-2** if it is being used for directional control.

Forward Direction	Rear Direction	Voltage on Coax or J12 Term C	Direction Shift
Element 1	Element 3	None	0°
Element 2	Element 4	+12 Vdc	90°
Element 3	Element 1	-12 Vdc	180°
Element 4	Element 2	12 Vac	270°

Table 5 - Differential Voltage Control Matrix

Internal Jumper Selection

To access the **DXE-RFS-2** jumper blocks, remove the 6 screws holding the connector plate of the **DXE-RFS-2** unit to the enclosure. Pull on the plate to separate it from the enclosure. The jumper blocks should be visible and oriented as shown in **Figure 5**.

> ***Important Note:*** *You cannot use coax or any other conductor for multiple functions. If you are going to use the coax for directional control, then you cannot use the coax for power-a separate cable must be used. We recommend using the default configuration.*

Default Jumper Configuration Settings

Figure 5 shows the default jumper settings for the **DXE-RFS-2**. For JMP1 & JMP2 the center and top pins of both are shorted. For JMP3 & JMP4, the center and bottom pins of both are shorted.

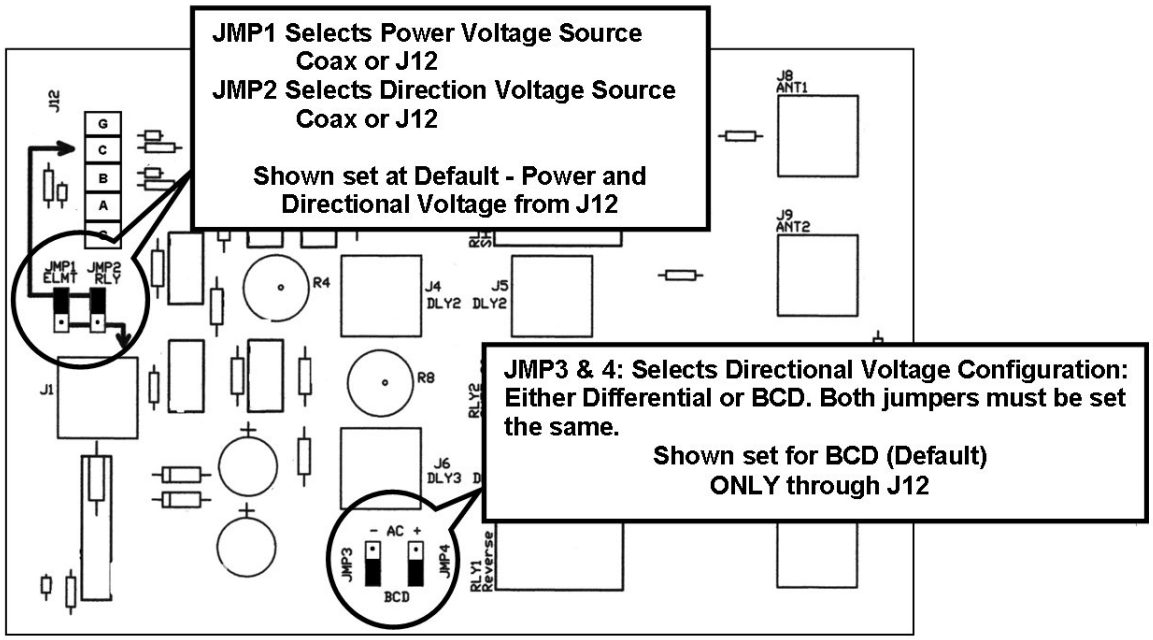


Figure 5 - Jumper Locations and Default Settings

Powering Through the Feedline

To power the **DXE-RFS-2** from the feedline, move the **JMP1** jumper block from the top and middle pins of the header to the lower and middle pins.

When the feedline is used for power, you can use either Terminal C on J12 for directional control using differential voltages, or Terminals A & B of J12 for BCD-style directional control. JMP3 and JMP4 are used to configure the directional control voltages. Both jumper blocks MUST be moved together as a pair. With their upper two pins shorted, differential voltage is enabled using Terminal C. With the lower two pins shorted, the BCD-style interface is enabled using Terminals A & B.

> Be very careful about configuring the jumper settings. **You must not jumper the DXE-RFS-2 so that power and directional control are done on the same conductor**. This could damage the **DXE-RFS-2** or the active elements and is not covered under warranty. JMP1 and JMP2 should NEVER be set with both of their jumper blocks on the lower two pins.

Directional Control Using the Feedline

To use the feedline for directional control, move the JMP2 jumper block from the top and middle pins to the bottom and middle pins.

When you use the feedline for directional control, you must also set both JMP3 and JMP4 to use differential voltage by moving the jumper blocks to the top and middle positions. Jumper blocks must be moved together as a pair.

A suitable controller, such as the **DXE-FVC-1**, must be used to couple the directional control voltages onto the coax as shown in **Diagram 2**.

Optimizing the Array

To determine if the antenna system output level is the limiting factor, tune the receiver to the lowest band at the quietest operating time. This is usually when propagation is poor but some signals are heard. Disconnect the antenna and set the receiver to the narrowest selectivity you expect to use. Receiver noise power is directly proportional to receiver bandwidth (going from 2.5 kHz selectivity to 250 Hz selectivity reduces noise by 10 dB). Connecting the antenna should result in a noticeable increase in noise. If so, the array signal level is sufficient and further optimization or amplification may not be needed.

If the array is used on 160m or below, the Active Antenna internal jumper should be set as shown in the Installation Section on page 12 of this manual. If the array still lacks sensitivity on the lower bands, then a preamplifier with high dynamic range should be used to compensate for the low signal level. Using a preamplifier when sufficient signal is already present may result in amplification of

the noise along with the signal. **It is always best to use the least gain possible**. Depending on conditions, a preamplifier can cause receiver overload; this may require an attenuator or bypassing the preamplifier.

The **DXE-RPA-1** HF Preamplifier has better dynamic range than most receivers and can be used to compensate for the decrease in array signal output. The **DXE-RPA-1** preamplifier is automatically bypassed when power is removed.

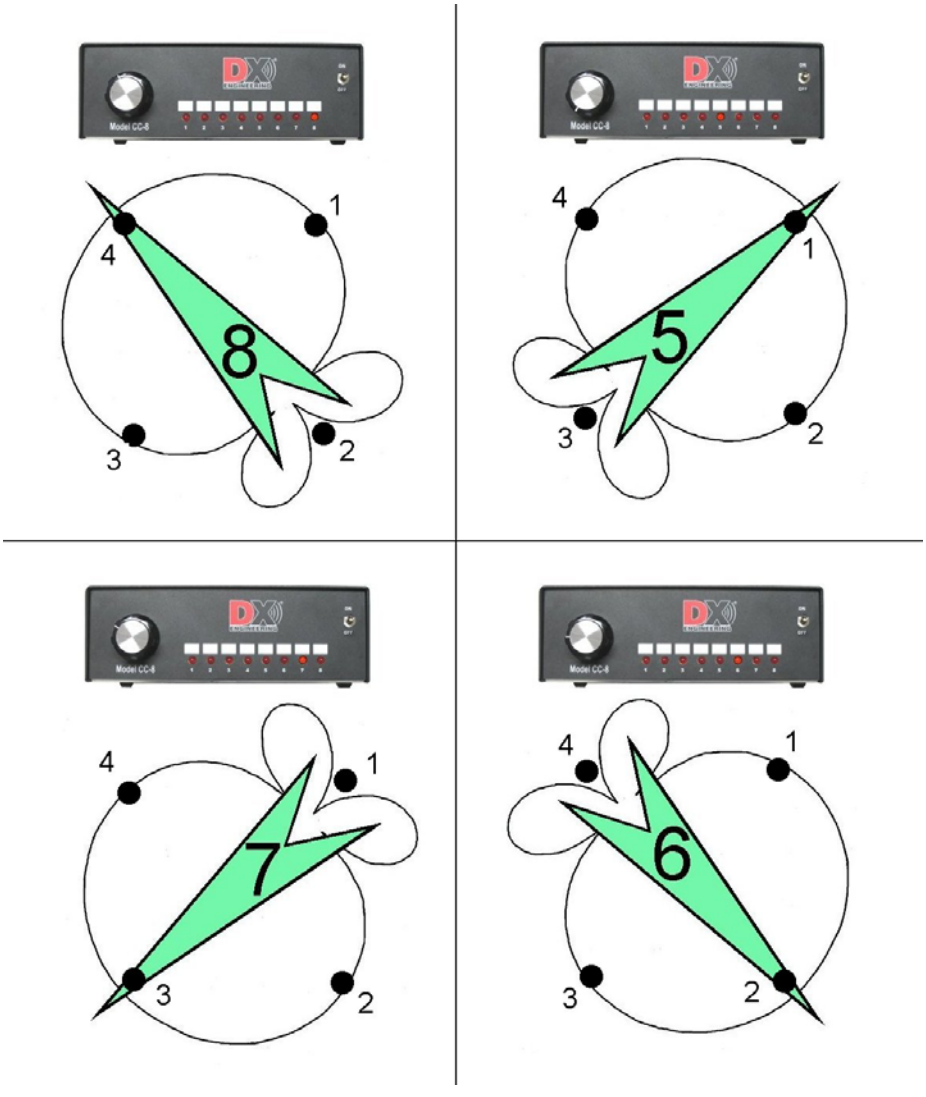
Front-to-Rear (Null) Optimizing

The **DXE-RFS-2** is factory adjusted to the correct settings for most coaxial cables. In some cases, the null depth may need to be adjusted to compensate for inaccurate delay line lengths. To adjust the null depth, tune to a strong steady signal off the back of the antenna's selected direction and adjust R4 and R8 for the deepest null (weakest signal off the back). Use **Figure 5** to locate R4 and R8 near the center of the circuit board.

Operation

When using the **DXE-RFS-2**, positions 5 though 8 on the **CC-8** Control Box will phase the appropriate active vertical elements to give you excellent receiving capabilities.

The front to back signal to noise ratio of the active vertical elements in the four phase array allow you to not only enhance the desired received signal, but also to decrease an unwanted receive signal by selecting a position that will drastically reduce or eliminate it.



Optional Items

DXE-RPA-1 - Receiver Preamplifier, 0.3-35 MHz

This is the best HF low noise amplifier available. The RPA-1 is optimized for 0.3-35 MHz operating range. The push-pull amplifier design and robust components enable it to withstand high signal levels and operate when you need it most. The dynamic range of the RPA-1 is better than most receivers.

The RPA-1 is suitable for indoor or outdoor installation, with the option of being powered through the coaxial feed. The metal housing provides shielding and improved lifespan. The unit uses RCA type phono jack and CATV F connector for the input and output connections, and has a relay that automatically bypasses the amplifier when dc power is removed.

Benefits:

- Push-pull operation eliminates harmonic distortion
- High quiescent current increases ability to handle strong signals without distortion or overload
- Meticulous craftsmanship and durable components provide superior dynamic range
- RCA type phono jack and type F connector ease installation
- Simplified switching - automatic bypass eliminates gain when dc power is off
- 10-18 Vdc power using power connector or through the coax
- 10-18 Vdc through coax enables remote operation at antenna

DXE-RFCC-1 - Receive Feedline Current Choke, 50 to 75 Ohm 300 kHz to 30 MHz

If you wish to reduce feedline radiation and improve reception, a Feedline Current Choke is recommended if your SWR is already low. Adding a DX Engineering Feedline Current Choke at the point where the feedline exits the area of the antenna will substantially reduce unwanted feedline radiation or reception without the need for improved station grounding.

The advantages of using an FCC:

- Prevents unwanted RFI by eliminating feedline current and radiation
- All power goes to the antenna, improving efficiency
- Reduces noise or unwanted signals picked-up by the feedline
- Overcome a less than optimal ground system

The DX Engineering RFCC-1 receive feedline common-mode choke is the most effective solution to common-mode noise or unwanted signal ingress available to date.

The DX Engineering RFCC provides thousands of ohms isolation between the input and output coaxial shield connections while passing desired signals, including dc or low frequency ac control signals. The RFCC has extremely high isolation impedance which effectively blocks common-mode noise or unwanted signals, even in the presence of very poor grounding.
Low noise receive antennas are traditionally located away from electrical wiring and other noise sources. Unfortunately, noise and other unwanted signals have a direct path to your low-noise antenna through the feedline shield connections between the station equipment and antenna.

Unwanted signals can also energize the outside of the feedline shield, and this undesired signal energy can be conducted directly to the receiving antenna. This can reduce antenna directivity. Unless you have a perfect zero-resistance RF ground at the antenna, some of the common-mode noise or unwanted signals from the feedline shield will make it into the antenna.
The RFCC is effective from 300 kHz to 30 MHz. It comes with standard CATV type “F” female connectors, although it can be used in any 50 to 75 ohm receiving system. The RFCC is a passive device, therefore requires no power to operate.

DXE-FVC-1 - Feedpoint Voltage Coupler

The FVC-1 provides an interface for standard control switches, such as the DXE-CC-8 or your own arrangement to voltage-multiplexed antenna systems. This interface system will provide the voltages required to remotely select up to four antennas (or four directions) through receiving or low power transmitting feedlines. It provides fuse-protected 0V, +12 Vdc, -12 Vdc, and 12 Vac. output voltages through a panel mounted feedline connector. These voltages can be used to provide four-direction switching of an antenna array either through the feedline or on a single wire supplemental control line. Control is done using a standard 1 of 4, BCD or switch closure interface.

The FVC-1 is recommended for use with the DX Engineering RFS-2P Remote Four-Square Antenna System , the RBS-1 Reversible Beverage Antenna System , and the RLS-2 Transfer Switch . The CC-8 Control Console can provide the 1 of 4 and BCD input used by the FVC-1 or you can use your own switch.

The FVC-1 also has two LED indicators, red and green, which indicate the presence and polarity of the output control voltage being used. They are directional indicators that can be read at a convenient distance and can aid in troubleshooting. Features

- Safe, external 12V heavy duty power pack.
- Metal Housing – superior shielding, rugged, and easy mounting
- Convenient installation– mounts anywhere in your shack
- Rugged Control Connector – reliable solder-less connections
- Internal thermal reset fuse- full protection against accidental shorts
- Flexible logic input- BCD or standard one-of-four, high or low actuated
- Operation indicators- bright red and green LED indicators can be seen at a distance

PPC-IS-75FB/18 - PolyPhaser Lightning Protector, 75 ohm, 18V DC Pass, Type F Connectors

The IS-75FB/18 was chosen to compliment the line of receive only antennas from DX Engineering. This is a 75 ohm lightning protector that has type F connectors and passes 18 VDC for control/power at the antenna units.

- Complies with IEEE 802.3 (50O)
- Broadband-low VSWR and loss
- Multi-strike capability
- Low voltage thresholds/Low throughput energy

DXE-CAVS-1P - V-Bolt Saddle Clamp, 1/2 in. to 1-3/4 in. O.D. Applications

This V-Clamp is made in one size that fits tubing from 1/2 to 1-3/4" O.D. as used in antenna construction. The supplied V-bolt is long enough to attach tubing to thick plates and is made with anti-corrosive properties.

The cast rippled surface of the saddle will clamp the tubing securely to a flat surface; however, for high-torque applications please use our standard U-Bolt Saddle Clamps.

- Used to clamp 1/2 to 1-3/4" (O.D.) tubing
- Designed for attachments that don't require resistance to torque
- V-bolt made from high-strength 18-8* stainless steel
- V-saddle cast from 535 aluminum with rippled surface

The use of an Anti-Seize compound is HIGHLY recommended to achieve proper torque and prevent galling.

DXE-81343, NSBT8 - Anti-Seize & Never-Seez

An Anti-seize compound MUST be used on any Stainless Steel nuts, bolts, clamps or other hardware to prevent galling and thread seizure. Any of these products can be used for this purpose.

*DXE-81343	Anti-Seize, 1 oz. Squeeze Tube
*DXE-81464	Anti-Seize, 8.5 oz. Aerosol Can
*DXE-NSBT8	Never-Seez, 8 oz. Brush Top
*DXE-NMBT8	Never-Seez, 8 oz. Brush Top, Marine Grade

*** These products are limited to domestic UPS Ground shipping only**

DXE-F6-1000 - 75 ohm F-6 Style Direct Bury Coax, 1000 ft. Spool Hi Quality, 75 Ohm F6 type "Flooded" Coax

Sold by the spool, or as Custom Cable Assemblies

Center Conductor: 18 AWG Copper-Clad Steel , Nominal Diameter: 0.040 in.
Dielectric: Gas Expanded Polyethylene, Nominal Diameter Over Dielectric: 0.180 in.
Shield: 1st Shield: Aluminum-Polypropylene-Aluminum, Laminated Tape with overlap Bonded to the Dielectric, Nominal Diameter Over Tape: 0.187 in.
2nd Shield: 34 AWG Aluminum Braid Wire, 60% Coverage
Jacket: PE (Flooded for Underground), Nominal Diameter Over Jacket: 0.272 in. , Nominal Jacket Thickness: 0.030 in.
Electrical Properties: Impedance: 75.0 +/- 3.0 Ohms, Velocity of Propagation: 85.0% Nominal

We recommend the use of Snap-N-Seal connectors to ensure a high quality and weather resistant feedline connection. The proper tool must be used to install these connectors.

DXE-CPT-659 - oax Cable Stripper for CATV F-6, RG-6 and RG-59 coax

Prepares CATV F-6, RG-6 and RG-59 coax cable for the installation of an "F" type connector.

- One-step cutting motion
- Precision cut
- No nicks or scratches to conductor
- Includes 1 replacement blade

DXE-RTV598335 - Permatex Black RTV Sealant, Non-Acetic - 3.3 oz Tube, Black

DX Engineering Approved RTV Sealant - We have all used RTV to seal water out of things, right? Have you ever sealed a piece of electronic gear with it -- then opened it some time later to find that it had still managed to become corroded inside? Guess what? It's not the rain that corroded it - It's the RTV! Normal RTV gives off acetic acid when it cures. That's the vinegar smell. The acetic acid causes the corrosion.
DX Engineering has located a Neutral Cure RTV made right here in Ohio that is non-corrosive and is safe for sealing those baluns and other electronic gear that are going to be out in the weather.
Applies just like "normal" RTV, dries in one hour and cures in 24 hours at 70 degrees F.
And it doesn't smell like vinegar!

- 3.3 oz. Tube
- Black

*This part is classified hazardous and is limited to domestic UPS Ground shipping only

DXE-SNS6-25 - Watertight Coax Connector, Snap-N-Seal for CATV F-6 Cable, 25 pieces

Snap-N-Seal is an environmentally sealed CATV F coax connector system for harsh environments. The connectors have a unique, 360 degree radial compression system that offers the signal leakage protection required for high performance receive systems.

- Quad sealed system prevents moisture from migrating into the connection
- 360 degree radial compression provides superior RF integrity (-95dB typical, 60% bonded foil cable)
- Easy cable preparation
- Connector to cable retention of 40 lbs minimum
- Superb impedance match to 1 GHz
- Manufactured of high quality 360 brass, cadmium plated with yellow chromate coating for maximum corrosion resistance
- UV-resistant plastic and O-rings provide a reliable environmentally sealed connector

An installation tool, such as the **DXE-SNS-CT1**, is required to install the connectors. Normal crimping tools or pliers will not work.

DXE-SNS-CT1 - Compression Tool for Snap-N-Seal 75 Ohm Coax Connectors

Ratchet compression tool for installing Snap-N-Seal 75 ohm Coax connectors. Ordinary pliers will not install these connectors properly.

DXE-CW9-1K - Shielded Control Wire, Economically Priced, 9 Conductor, 1000 ft Reel

Economically priced DXE-CW9-1K is a 1000 foot box of high quality shielded outdoor FTP (Foil Twisted Pair) Cat5e cable. It features 4 Twisted pairs of 24 AWG solid wire with Al foil shielding plus a solid tinned copper drain wire - providing a total of 9 conductors for DC switching applications. It has a polyethylene jacket and is rated for direct burial.

This cable is ideal for DX Engineering Remote Antenna Switches and Four Square arrays, and should be considered for any low-current custom remote switching application you have - such as receiving antenna arrays. A nice feature is the "rip cord", which allows for easy stripping of the heavy jacket without worry about nicking or accidentally cutting the conductors.

Excellent for use in all outdoor applications of switching, networking, data transfer and phone lines. As a data transfer line, it supports 10/100/1000Mbps.

The Shielded Control Wire may also be purchased 'by the foot' - call DX Engineering for details.

DXE-900031 - Automatic Wire Stripper/Crimper/Cutter, 24-10 Ga.

Our DX Engineering wire stripper uses a spring-loaded design to make quick work of wires ranging from 24 to 10 gauge. Just insert the wire, squeeze the handle, and listen for the click. That's the sound of another perfect wire stripping job performed in about 2 seconds- a fraction of the time it takes your pocket knife to do the same job.

An adjustable wire length guide helps you make uniform strips, and a built-in wire cutter and crimper helps you complete your wiring job.

- Spring-loaded design
- Strips wires ranging from 24 to 10 gauge
- built-in wire cutter and crimper

DXE-11055 - Klein-Kurve Wire Stripper / Cutter 11055, 18-22 AWG

Klein Tools Klein-Kurve wire strippers are ideal for stripping solid (10-18 AWG) and stranded (12-20 AWG) wire cleanly and easily. The 7 1/8 in. strippers also have precise shear-type blades to cut copper wire nicely, easy-to-read markings on both sides, and extra-soft grips and curved handles for comfort.

Technical Support

If you have questions about this product, or if you experience difficulties during the installation, contact DX Engineering at (330) 572-3200. You can also e-mail us at:

DXEngineering@DXEngineering.com

For best service, please take a few minutes to review this manual before you call.

Warranty

All products manufactured by DX Engineering are warranted to be free from defects in material and workmanship for a period of one (1) year from date of shipment. DX Engineering's sole obligation under these warranties shall be to issue credit, repair or replace any item or part thereof which is proved to be other than as warranted; no allowance shall be made for any labor charges of Buyer for replacement of parts, adjustment or repairs, or any other work, unless such charges are authorized in advance by DX Engineering. If DX Engineering's products are claimed to be defective in material or workmanship, DX Engineering shall, upon prompt notice thereof, issue shipping instructions for return to DX Engineering (transportation-charges prepaid by Buyer). Every such claim for breach of these warranties shall be deemed to be waived by Buyer unless made in writing. The above warranties shall not extend to any products or parts thereof which have been subjected to any misuse or neglect, damaged by accident, rendered defective by reason of improper installation, damaged from severe weather including floods, or abnormal environmental conditions such as prolonged exposure to corrosives or power surges, or by the performance of repairs or alterations outside of our plant, and shall not apply to any goods or parts thereof furnished by Buyer or acquired from others at Buyer's specifications. In addition, DX Engineering's warranties do not extend to other equipment and parts manufactured by others except to the extent of the original manufacturer's warranty to DX Engineering. The obligations under the foregoing warranties are limited to the precise terms thereof. These warranties provide exclusive remedies, expressly in lieu of all other remedies including claims for special or consequential damages. SELLER NEITHER MAKES NOR ASSUMES ANY OTHER WARRANTY WHATSOEVER, WHETHER EXPRESS, STATUTORY, OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS, AND NO PERSON IS AUTHORIZED TO ASSUME FOR DX ENGINEERING ANY OBLIGATION OR LIABILITY NOT STRICTLY IN ACCORDANCE WITH THE FOREGOING.

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